BE I VII / MECH / RAC / NOV. 2012

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Con. 9719-12.   **(REVISED COURSE)**   **KR–1131**

(3 Hours)   **[Total Marks : 100**

(1) Question 1 is compulsory.
(2) Attempt any 4 questions out of remaining 6 questions.
(3) Clearly mention the assumptions made if any.
(4) Use of Refrigerant, Psychometric charts and tables, steam table are permitted
(5) Do not attach any Xerox copy of chart or table to answer book

1. Attempt any FOUR :   20

     a) Discuss the below statement
        "Refrigeration can be produced either by expansion of a gas or throttling of gas"

     b) Derive the COP equation for the Carnot refrigeration cycle. Also write the
        practical difficulties with Carnot refrigeration system?

     c) Explain the need for aircraft air refrigeration

     d) Define the term 'By-Pass factor' used for cooling or heating coil. Also explain apparatus dew
        point temperature

     e) To what do you attribute the rapid growth of refrigeration technology over the last century?

2. a) Explain the household refrigeration system in detail. Draw sketches and various
      plots pertaining to your answer.   8

    b) What are the important considerations in the design of air conditioning system.   6

    c) Draw schematic of Reduced ambient air cooling system and represent the operating cycle of
      the same on T-s chart.   6

3. a)   Write a note on Defrosting including causes of frosting and need of defrosting.   8

   b)   A bootstrap cooling system of 35 T is required for an aircraft. Temperature and pressure of
      the atmosphere is 18 C and 0.75 bar. Pressure of air is increased 0.75 bar to 0.92 bar due to
      ramming. Pressure of air leaving the main compressor and auxiliary are 3.2 and 5.4 bar
      respectively. Isentropic efficiency of both compressors is 84% and of turbine is 81%. Heat
      removed from air leaving the compressor is 60% in the first heat exchanger and 34% in the
      second heat exchanger which is after auxiliary compressor. Assuming ramming to be
      isentropic and cabin pressure 1.03 bar, find Power required to take cabin load and COP of the
      system. Temperature of the air leaving the cabin is 28 C .   12

4. a) Discuss the relative merits and demerits of vapour absorption and vapour compression
     refrigeration systems. Draw a neat compact diagram of Lithium bromide – Water absorption
     refrigeration system and explain its working in brief.   08

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b) A vapour compression system using R12 works between −10 C and 35 C as evaporator and condenser temperature respectively. Using P-H chart determine

12

    i)   COP
    ii)   Mass flow of refrigerant per TR
    iii)   Piston displacement per TR using volumetric efficiency = 84%
    iv)   Heat rejected in the condenser per TR
    v)   Ideal COP

5.   An air conditioning system is to be designed for a restaurant with the following data :-

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i.	Outside design conditions	42 C DBT, 26 C WBT,
ii.	Inside design conditions	25 C DBT, 50 % RH,
iii.	Solar heat gain through glass	5.6 kW
iv.	Solar heat gain through walls, roof and floor	5.87 kW
v.	Occupants	35
vi	Sensible heat gain per person	57 W
vii.	Latent heat gain per person	57 W
viii.	Internal lighting load	12 lamps of 100 W
		7 lamps of 60 W
		12 fluorescent tubes of 40 W
ix.	Infiltrated air	16 CMM

If 25 % fresh air and 75 % re-circulated air is mixed and passed through the conditioner coil, find

i) The amount of total air required in m³/hr
ii) The DPT of the coil
iii) The condition of supply air to the room
iv) The capacity of conditioning plant.
Assume BPF = 0.2.

6. a) Explain Electrolux refrigeration system with a neat sketch.   **08**

   b) How the refrigerants are classified? Discuss briefly the factors affecting choice of refrigerants commonly used in refrigerating plants.   **06**

   c) Explain the terms DBT, WBT, and RH   **06**

7.   Write short notes ANY FOUR   **20**

   a) Deep sea water air conditioning   b)   Cooling tower

   c) Air conditioning and human comfort   d)   Duct designing

   e) Condensers used in refrigeration plants